



## STGB10NB37LZ

### N-CHANNEL CLAMPED 20A - D2PAK INTERNALLY CLAMPED PowerMesh™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGB10NB37LZ	CLAMPED	< 1.8 V	20 A

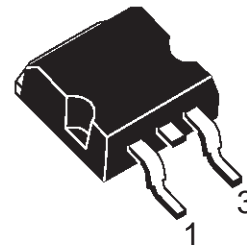
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

#### DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The built in collector-gate zener exhibits a very precise active clamping while the gate-emitter zener supplies an ESD protection.

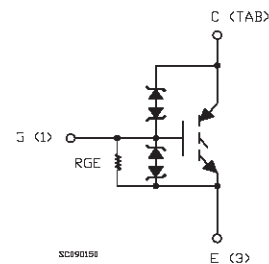
#### APPLICATIONS

- AUTOMOTIVE IGNITION



D2PAK

#### INTERNAL SCHEMATIC DIAGRAM



#### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	CLAMPED	V
V <sub>ECR</sub>	Reverse Battery Protection	18	V
V <sub>GE</sub>	Gate-Emitter Voltage	CLAMPED	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>C</sub> = 100°C	20	A
I <sub>CM</sub>	Collector Current (pulse width < 100μs)	60	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	125	W
	Derating Factor	0.83	W/°C
ESD	ESD (Human Body Model)	4	KV
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

**THERMAL DATA**

Rthj-case	Thermal Resistance Junction-case Max	1.2	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.2	°C/W

**ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)**

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV(CES)	Clamped Voltage	$I_C = 2 \text{ mA}$ , $V_{GE} = 0$ , $T_J = -40^\circ\text{C}$ to $150^\circ\text{C}$	375	400	425	V
BV(ECR)	Emitter Collector Break-down Voltage	$I_{EC} = 75 \text{ mA}$ , $V_{GE} = 0$ , $T_J = -40^\circ\text{C}$ to $150^\circ\text{C}$	18			V
BV <sub>GE</sub>	Gate Emitter Break-down Voltage	$I_G = \pm 2 \text{ mA}$ $T_J = -40^\circ\text{C}$ to $150^\circ\text{C}$	12		16	V
I <sub>CES</sub>	Collector cut-off Current ( $V_{GE} = 0$ )	$V_{CE} = 15 \text{ V}$ , $V_{GE} = 0$ , $T_J = 150^\circ\text{C}$ $V_{CE} = 200 \text{ V}$ , $V_{GE} = 0$ , $T_C = 150^\circ\text{C}$			10 100	$\mu\text{A}$ $\mu\text{A}$
I <sub>GES</sub>	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 10 \text{ V}$ , $V_{CE} = 0$			$\pm 700$	$\mu\text{A}$
R <sub>GE</sub>	Gate Emitter Resistance			20		K $\Omega$

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	$V_{CE} = V_{GE}$ , $I_C = 250 \mu\text{A}$ , $T_J = -40^\circ\text{C}$ to $150^\circ\text{C}$	0.6		2.4	V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5 \text{ V}$ , $I_C = 10 \text{ A}$ , $T_J = 25^\circ\text{C}$ $V_{GE} = 4.5 \text{ V}$ , $I_C = 10 \text{ A}$ , $T_C = -40^\circ\text{C}$		1.2 1.3	1.8	V V
I <sub>C</sub>	Collector Current	$V_{GE} = 4.5 \text{ V}$ , $V_{CE} = 9 \text{ V}$	20			A

**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	$V_{CE} = 15 \text{ V}$ , $I_C = 20 \text{ A}$		18		S
C <sub>ies</sub>	Input Capacitance	$V_{CE} = 25 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{GE} = 0$		1250		pF
C <sub>oes</sub>	Output Capacitance			103		pF
C <sub>res</sub>	Reverse Transfer Capacitance			18		pF
Q <sub>g</sub>	Gate Charge	$V_{CE} = 320 \text{ V}$ , $I_C = 10 \text{ A}$ , $V_{GE} = 5 \text{ V}$		28		nC

## FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_L$	Latching Current	$V_{Clamp} = 320\text{ V}$ , $T_C = 125\text{ }^\circ\text{C}$ $R_{G\text{OFF}} = 1\text{ K}\Omega$ , $V_{GE} = 5\text{ V}$ $L = 300\mu\text{H}$	20			A
U.I.S.	Unclamped Inductive Switching Current	$R_{G\text{OFF}} = 1\text{ K}\Omega$ , $L = 1.6\text{ mH}$ , $T_C = 125\text{ }^\circ\text{C}$ , $V_{CC} = 30\text{ V}$	15			A

## SWITCHING ON

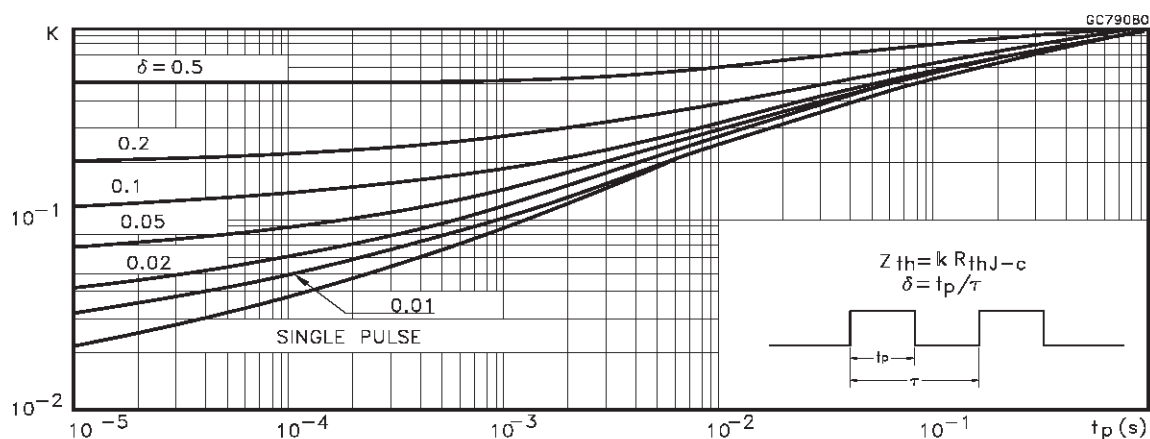
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{on})}$	Turn-on Delay Time	$V_{CC} = 320\text{ V}$ , $I_C = 10\text{ A}$		520		ns
$t_r$	Rise Time	$R_G = 1\text{ K}\Omega$ , $V_{GE} = 5\text{ V}$		340		ns
$(di/dt)_{\text{on}}$	Turn-on Current Slope	$V_{CC} = 320\text{ V}$ , $I_C = 10\text{ A}$		17		A/ $\mu\text{s}$
$E_{\text{on}}$	Turn-on Switching Losses	$R_G = 1\text{ K}\Omega$ , $V_{GE} = 5\text{ V}$		180		$\mu\text{J}$

## SWITCHING OFF

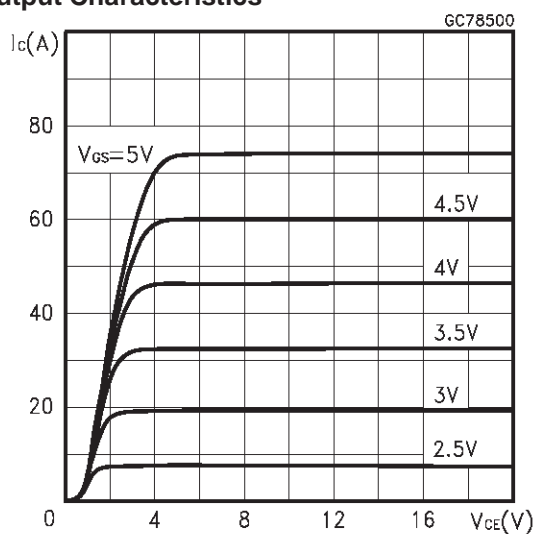
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-over Time	$V_{\text{clamp}} = 320\text{ V}$ , $I_C = 10\text{ A}$ , $R_{GE} = 1\text{ K}\Omega$ , $V_{GE} = 5\text{ V}$		4		$\mu\text{s}$
$t_r(V_{\text{off}})$	Off Voltage Rise Time			2.2		$\mu\text{s}$
$t_{d(\text{off})}$	Delay Time			14.8		$\mu\text{s}$
$t_f$	Fall Time			1.5		$\mu\text{s}$
$E_{\text{off}}(**)$	Turn-off Switching Loss			4.0		mJ
$t_c$	Cross-over Time	$V_{\text{clamp}} = 320\text{ V}$ , $I_C = 10\text{ A}$ , $R_{GE} = 1\text{ K}\Omega$ , $V_{GE} = 5\text{ V}$ $T_J = 125\text{ }^\circ\text{C}$		5.2		$\mu\text{s}$
$t_r(V_{\text{off}})$	Off Voltage Rise Time			2.8		$\mu\text{s}$
$t_{d(\text{off})}$	Delay Time			15.8		$\mu\text{s}$
$t_f$	Fall Time			2		$\mu\text{s}$
$E_{\text{off}}(**)$	Turn-off Switching Loss			6.5		mJ

(●) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %. (1) Pulse width limited by max. junction temperature. (\*\*) Losses Include Also the Tail

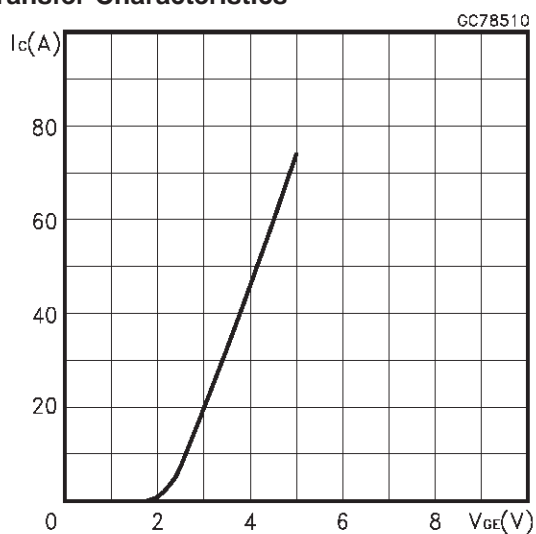
## Normalized Transient Thermal Impedance



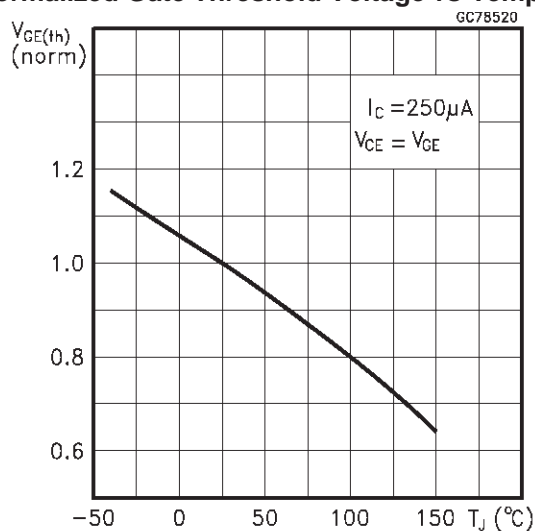
## Output Characteristics



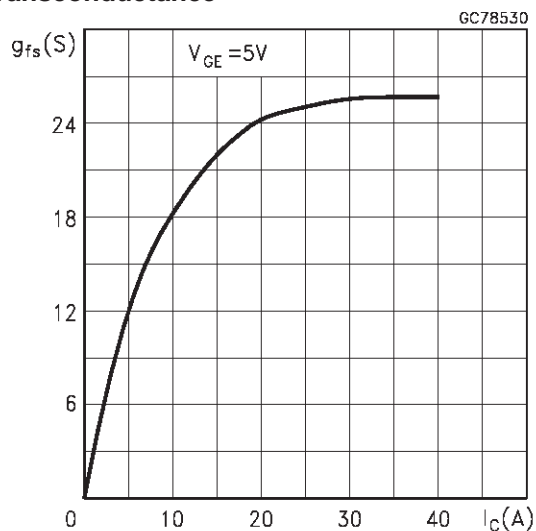
## Transfer Characteristics



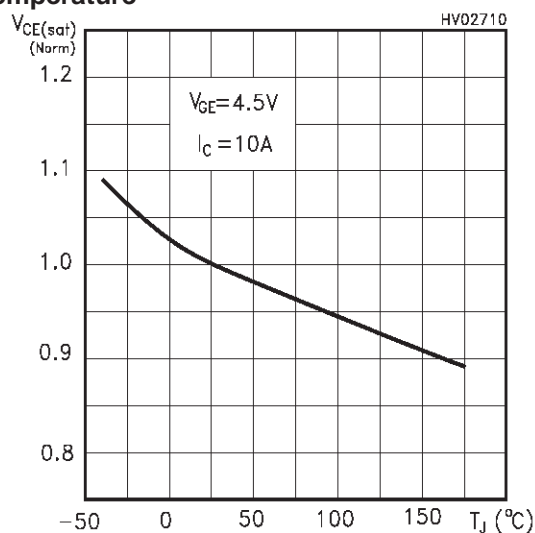
## Normalized Gate Threshold Voltage vs Temp.



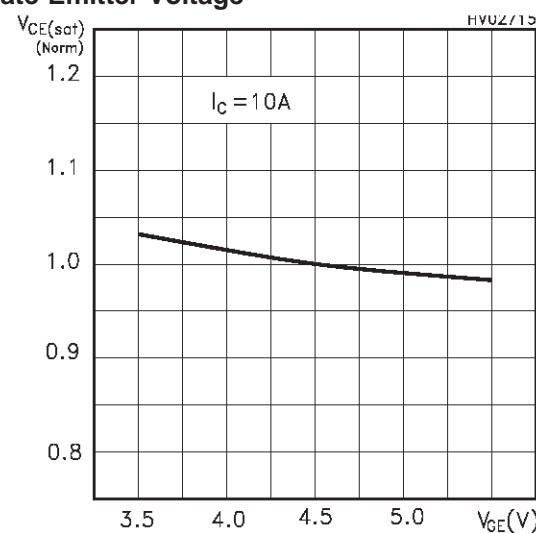
## Transconductance



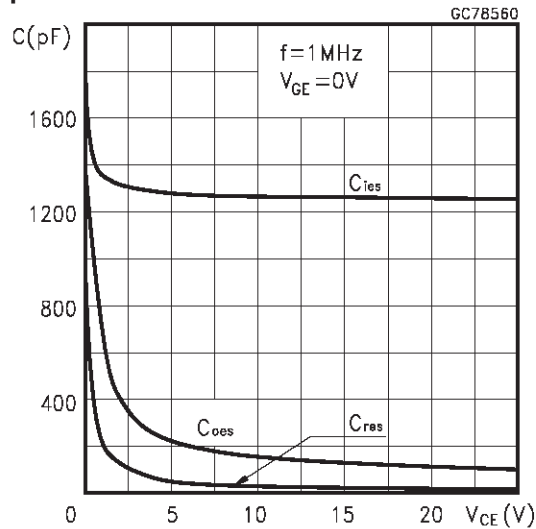
## Normalized Collector-Emitter On Voltage vs Temperature



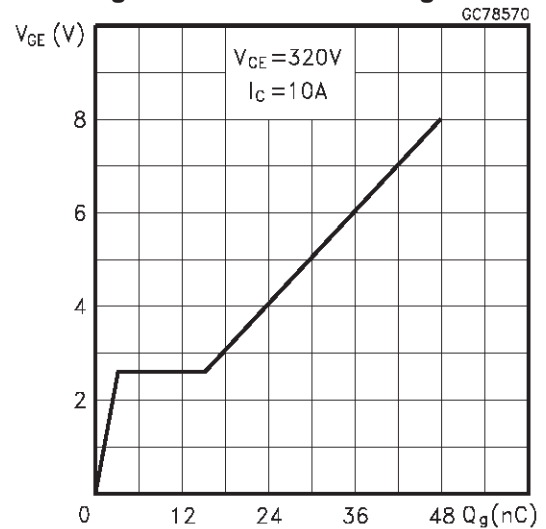
## Normalized Collector-Emitter On Voltage vs Gate-Emitter Voltage



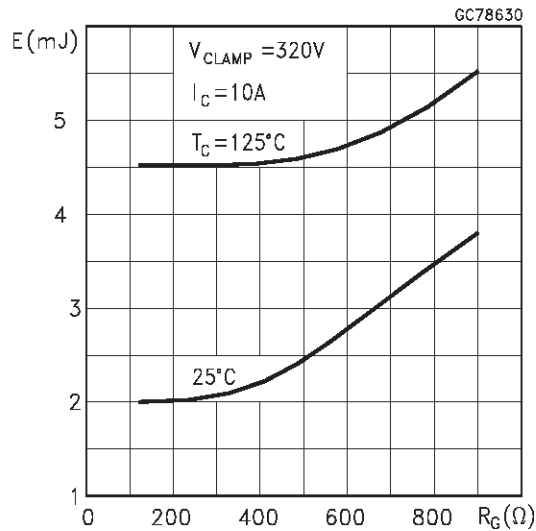
### Capacitance Variations



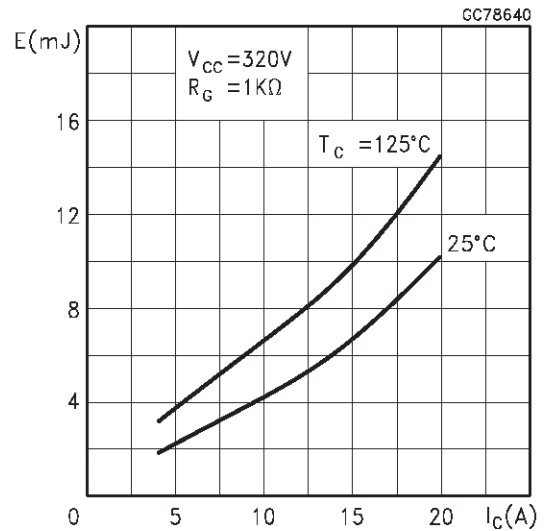
### Gate Charge vs Gate-Emitter Voltage



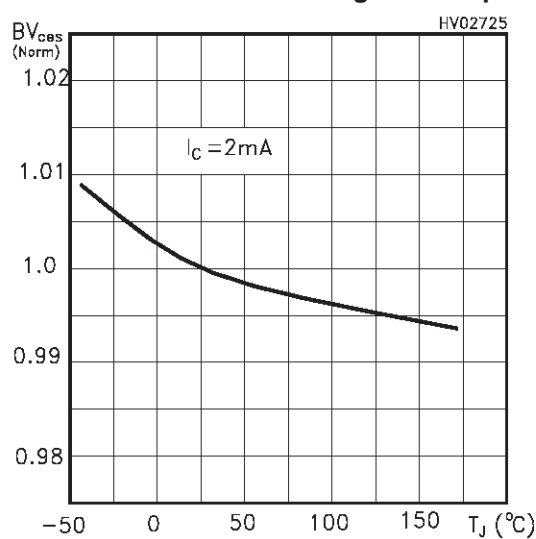
### Off Losses vs Gate Resistance



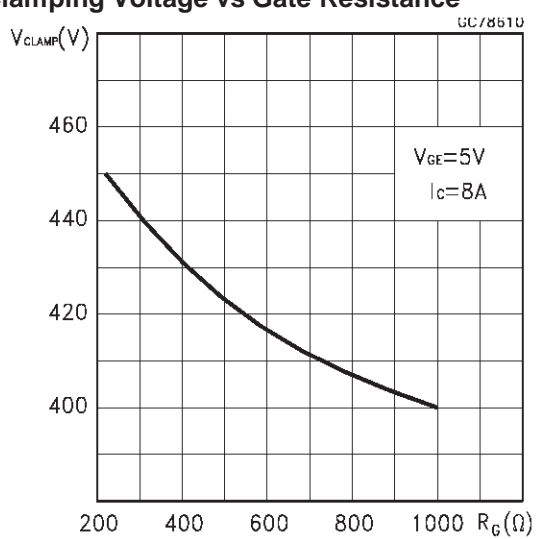
### Off Losses vs Collector Current



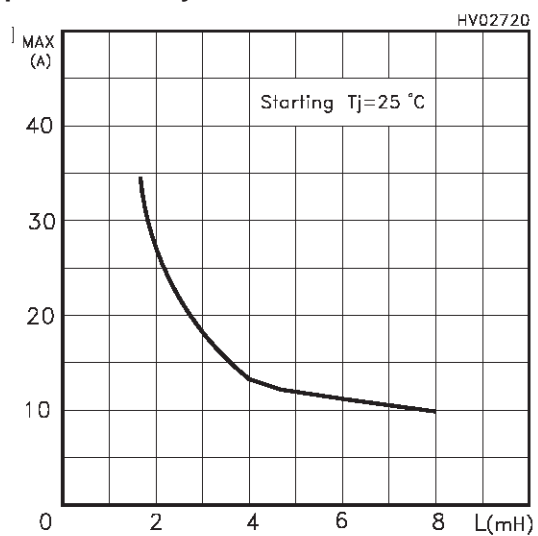
### Normalized Break-down Voltage vs Temp.

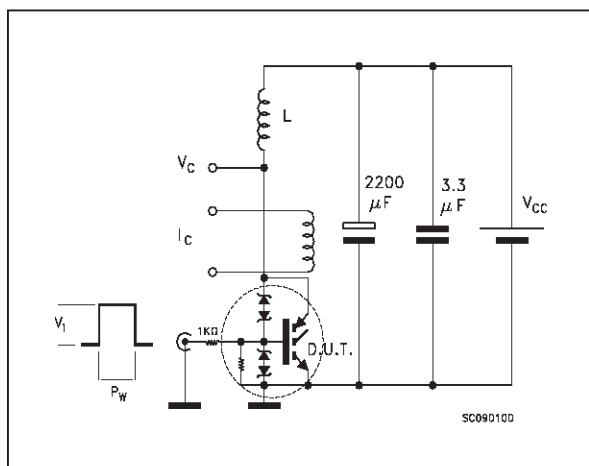
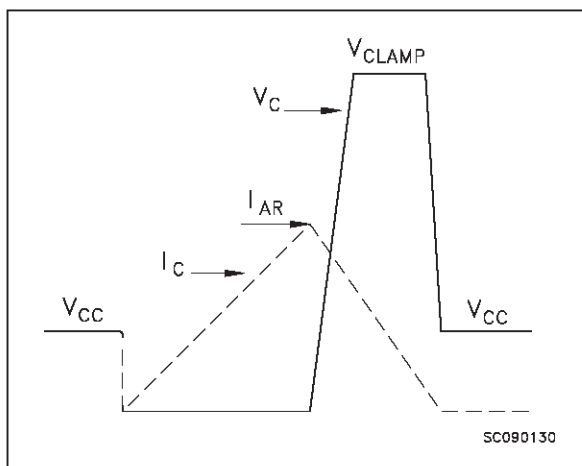
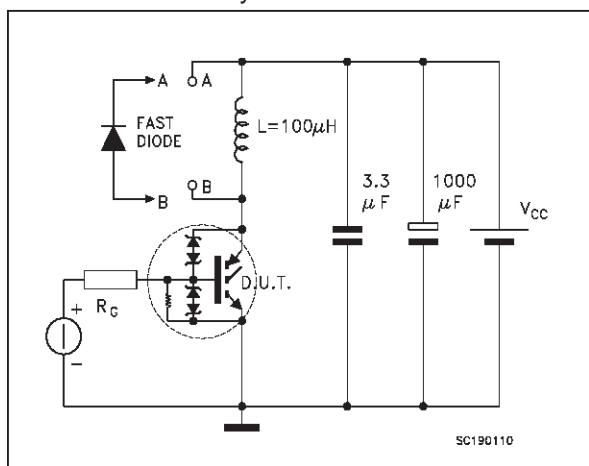
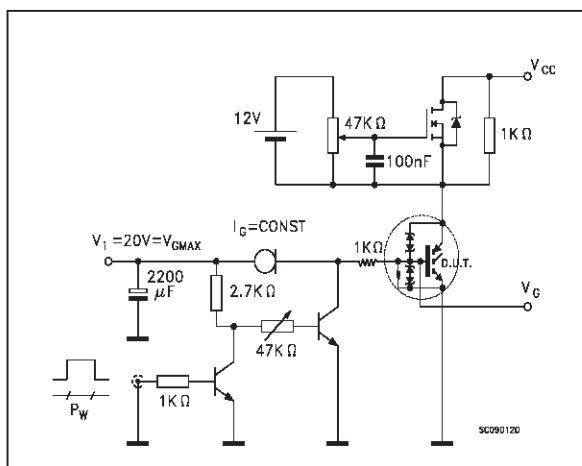


### Clamping Voltage vs Gate Resistance



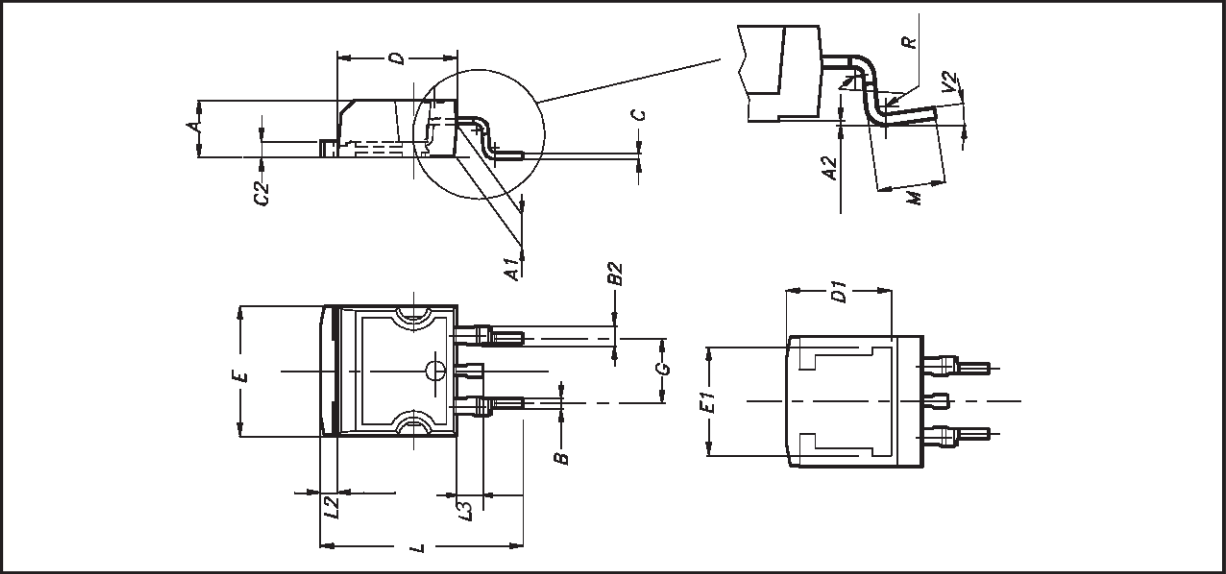
**Self Clamped Inductive Switching I<sub>MAX</sub> vs  
Open Secondary Coil**



**Fig. 1: Unclamped Inductive Load Test Circuit****Fig. 2: Unclamped Inductive Waveform****Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times****Fig. 4: Gate Charge test Circuit**

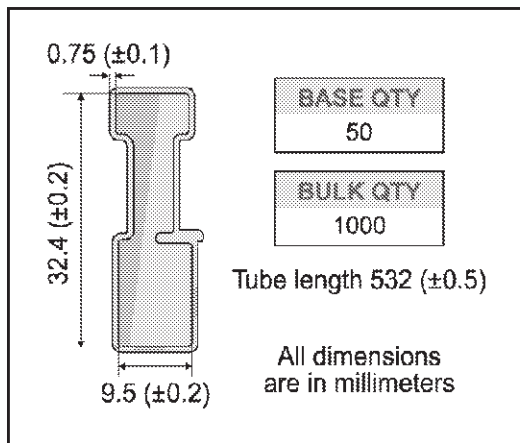
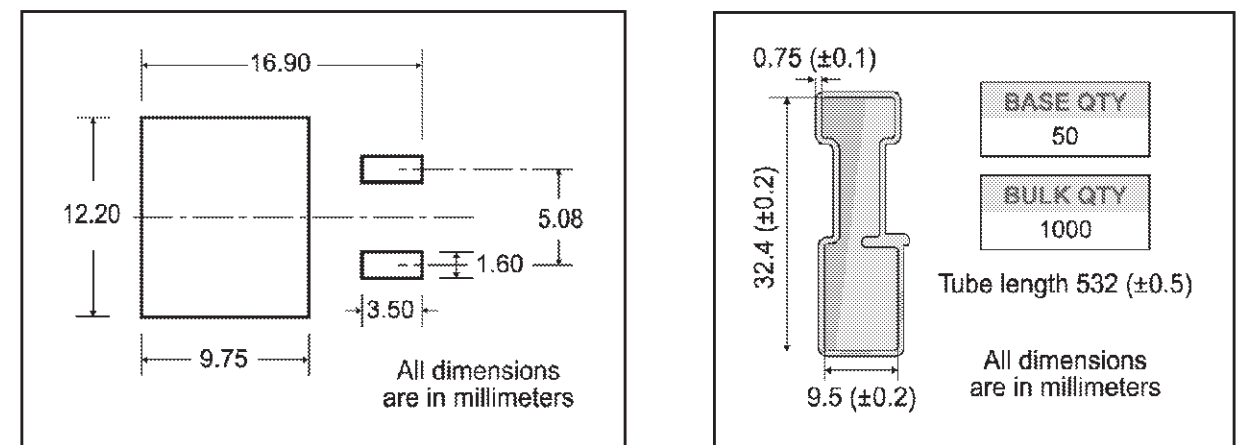
D<sup>2</sup>PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		8°			

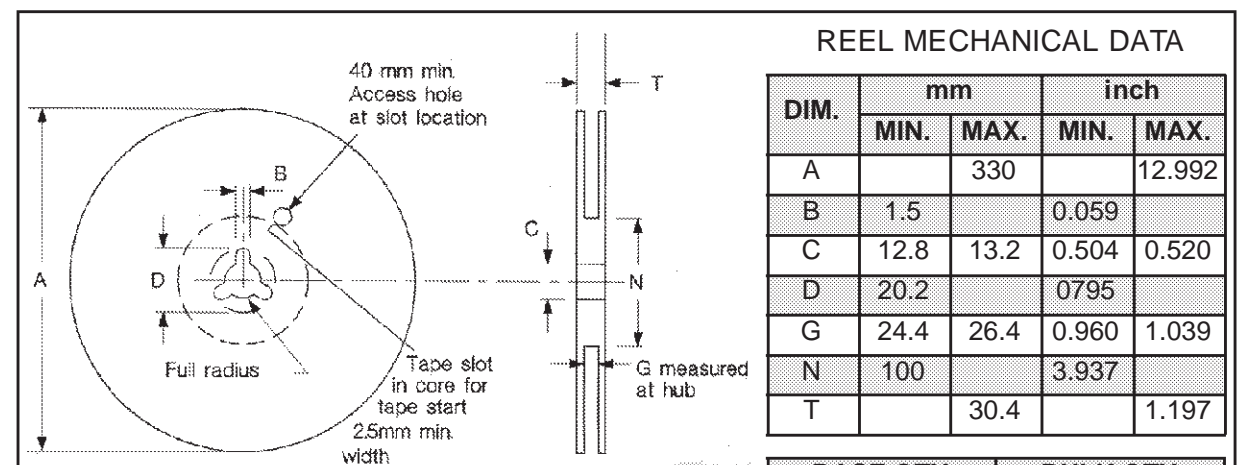




**D<sup>2</sup>PAK FOOTPRINT                      TUBE SHIPMENT (no suffix)\***



### TAPE AND REEL SHIPMENT (suffix "T4")\*



TAPE MECHANICAL DATA		BASE QTY	BULK QTY

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956

Technical drawing of a 16-pin D-sub connector showing side, top, and bending radius views with dimensions and labels.

**Side View Dimensions:**

- $K_0$ : Pin height
- $T$ : Pin thickness
- $P_2$ : Pin pitch
- $P_0$ : Pin offset
- $E$ : Pin length
- $B_c$ : Body width
- $B_s$ : Body thickness
- $A_c$ : Pin spacing
- $P_1$ : Pin pitch
- $F$ : Pin length
- $W$ : Body width

**Top View Dimensions:**

- $P_2$ : Pin pitch
- $P_0$ : Pin offset
- $E$ : Pin length
- $B_c$ : Body width
- $B_s$ : Body thickness
- $A_c$ : Pin spacing
- $P_1$ : Pin pitch
- $F$ : Pin length
- $W$ : Body width

**Bending Radius View:**

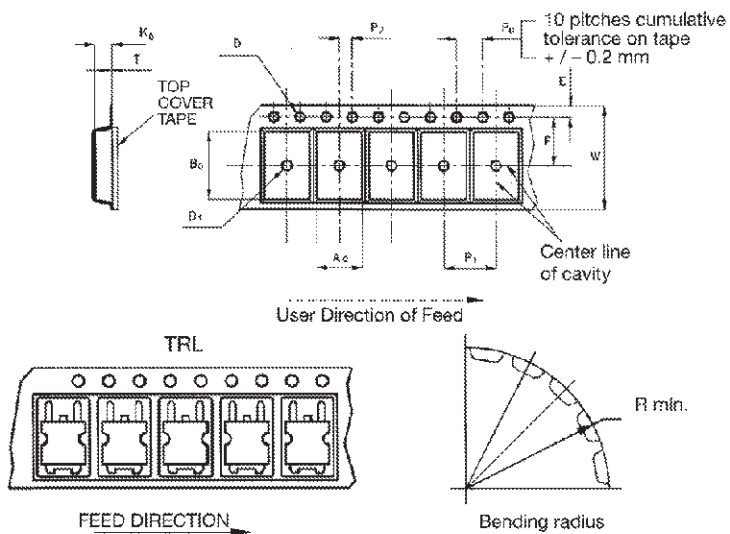
- $R$ : Bending radius
- $R \text{ min.}$ : Minimum bending radius

**Labels:**

- TOP COVER TAPE
- User Direction of Feed
- FEED DIRECTION
- Center line of cavity

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000



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